

AMENDMENTS TO THE DRAWINGS

Please delete Fig. 7 in its entirety

REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks is respectfully requested.

Claim amendments/Status

In this response, claim 1 is amended in a manner to improve clarity and syntax and to overcome the issues raised under 35 USC § 112. New claims 74 and 76 have been added. Support for the subject matter set forth in these newly claims can be found in at least Figs. 1 and 2 and paragraph [0021] of United States Patent Application publication No. 20050092664.

Claims 43-54 and 56-76 are therefore pending in the application.

Specification/Drawings

In this response Figure 7 and its reference in the specification has been deleted. This is seen as overcoming the new matter issues raised on page 2 of this Office Action.

Rejections under 35 USC § 112

1) The rejection of claims 43-54 and 72 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, is respectfully traversed.

In this response, claim 43 has been amended in a manner which overcomes the shortcomings noted on the paragraph spanning pages 2 and 3 of this Office Action. More specifically, claim 43 has been amended to change the expression “filter container” to “filter vessel” thus obviating the antecedent basis issue. This claim has been further amended to call for the membrane module to have a length to diameter ratio of about 6 to 1 and to house a spiral thin film composite membrane having an over all thickness ranging between 130 to 170 microns, and such that the spiral thin film composite membrane allows water to pass therethrough and circulate in the device, while retaining other components.

In connection with six solenoid valves, the back-pressure regulator and the parts “listed in (d)”, it is respectfully submitted that claims are not intended explain the operation of claim elements, but to list elements and the nexus with other elements. It is submitted that this has been done in this instance. The six solenoid valves are recited as being associated with the water reservoir, the air compressor and the membrane module. The function of these six solenoid valves is control the direction of flow of the permeate, concentrated extract, water and compressed air respectively during concentrate, drain and wash modes. In addition to this, the back-pressure regulator is recited as being associated with at least one of the six solenoid valves. Furthermore, the membrane module is required to be adapted for fluid connected with the water reservoir and the air compressor.

Sufficient interconnection between recited elements (viz., nexus between the claimed elements) is established and permits the claims to meet the requirements of § 112.

2) The rejection of claims 43-54 and 72 under 35 USC 112, first paragraph, as failing to comply with the enablement requirement, is respectfully traversed.

The amendments to claim 1 overcome this rejection and to make it clear how the membrane device enables the recirculation,

3) The rejection of claims 43-54 and 72 under 35 USC 112, first paragraph, as being based on a disclosure which is not enabling, is traversed.

The disclosure contains adequate disclosure of the six solenoid valves to enable their claiming. See paragraphs [0021], [0031], [0038], [0057], [0070], [0072], [0108], [0109], [0112], [0113], [0115] and [0121] of United States Patent Application publication No. 20050092664, for example

Rejections under 35 USC § 102/103

The rejection of:

1) claims 43-54 and 72 under 35 USC 102(b) as being anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Daly et al (US 6,120,688); and

2) claims 43-54 and 72 under 35 USC 103(b) as being unpatentable over JP 05-201872

or Lawhon et al (US 4,643,902) with evidence from Gobel et al (US 4,491,600) and/or Dorai et al (US 5,434,315); are both traversed.

1) US patent no. 5,434,315 to Dorai et al. discloses a process for the fractionation of polyether glycols of different molecular weight distribution using ultra-filtration membranes of different molecular weight cut off values. It does not teach in any way the concentration of low molecular weight aqueous extracts. The present invention differs from this reference in the following aspects.

a) The present invention discloses a device wherein spiral module of reverse osmosis membrane having NaCl rejection of 92-94% has been used for the concentration of aqueous herbal extracts at room temperature by recycling retentate continuously. Water and very low molecular weight solutes pass through the membrane at considerably low operating pressure than the commercial RO membranes which have NaCl rejections of >99%.

b) The OF membranes used in the cited US patent have very high molecular weight cut off values than the solutes present in the herbal extract and are not useful for concentration of extracts. Whereas, the membranes of the present invention have the capability to concentrate the low molecular weight extracts.

2) US Patent No. 4,491,600 (Lobel et al.) discloses a process for the separation of high molecular weight unwanted enzymes and other materials from fruit juice by fractionation using ultrafiltration membranes having specific molecular weight cut off value. In this process the low molecular weight vitamins, aroma, color materials, etc., pass through the high cut off value membrane whereas, the high molecular weight proteins and enzymes are rejected. The cited document does not teach in any way the concentration of low molecular weight aqueous extracts.

The present invention differs from the said patent in the following aspects.

a) The present invention discloses a device with spiral RO module for the concentration of aqueous herbal extracts at room temperature by recycling retentate continuously in a single step.

It differs from the cited patent wherein two steps are involved: i) purification of the juice by UF membrane and ii) Concentration of OF permeate by freezing at low temperature and removing the ice crystals. This process requires more time and energy as it involves two steps of fractionation and low temperature freezing and crystal separation manually.

3) US patent No. 4,643,902 (Lowhan et al.) discloses a process for the concentration of fruit juice in two steps in which the first step is the removal of unwanted microorganisms by UF membrane process, and followed by RO concentration of the OF permeate using tubular RO membranes having > 99% rejection for NaCl. The present invention differs from the cited US patent as given below:

a) The present invention discloses a device wherein spiral module of thin turn composite reverse osmosis membrane having NaCl rejection of 92-94% has been used for a single step concentration of aqueous herbal extracts at room temperature by recycling retentate continuously. Water passes through the membrane at considerably low operating pressure than the commercial RO membranes which have NaCl rejections of >99%, as reported in the Lowhan's patent.

b) The present invention specifically teaches the simple device, as explained in the specification, for the concentration and purification of aqueous extracts at ambient temperature and moderate applied pressure whereas, the cited reference does not teach about the device and the concentration aspects.

c) The present invention uses spiral modules which have several advantages in terms of higher output, lesser space and low energy consumption compared to the tubular membranes reported by the Lowhan et al.

4) JP 05-201872 discloses a process for the concentration of vegetable crude drugs by RO process, especially using commercial cellulose acetate membranes. The process involves the pH adjustment of the drug solution between 3-9 using acid or alkaline solution. The present invention differs from the cited JP patent as given below:

- a) The present invention uses the indigenous polyamide thin composite membrane having NaCl rejection of 92-94%.
- b) No pH adjustment is required for concentration of the aqueous extract.
- c) The present invention discloses not only the process of concentration but also device consisting of various components with the facility for recirculation of the RO retentate to achieve greater than 80% concentration.
- d) The present invention discloses the concentration of the solutions at the operating pressures of around 5-6 kg/cm² in order to avoid pressure impact on the sensitive natural compounds. Whereas, the cited document (JP 05-201872) describes that the concentration of the extract is carried out at 1-60 kg/cm² which is a very broad range and can't be considered as RO process alone.
- 5) US patent 6,120,688 (Daly et al.) discloses a method and apparatus for producing drinking water from impure water and more particularly, it relates to a portable apparatus and method for producing drinking water from impure water using micro-filtration unit and reverse osmosis unit which permits continued operation of the reverse osmosis unit during cleaning or back flushing the micro-filtration unit to efficiently produce portable water.
- a) The present invention differs from the cited prior art in the sense that the device can speedily remove more than 80% water and prevent degradation of temperature sensitive bioactive molecules from the aqueous plant extracts at ambient temperature. Moreover, the cited US patent does not teach nor solves the technical problem of speedy removal of water from the aqueous extracts of plant without degradation of bioactive molecules. Therefore, the cited US patent has the limitation which can be circumvented by this invention. The device of the present invention is suitable for effective concentration of herbal extracts, at the same time retaining all the important constituents and bioactive compounds in the concentrate. Besides, it has advantage for automatic washing of membranes and thus minimizes the problems of membrane bio fouling. This is not mentioned in any of the cited prior art.

Conclusion

It is respectfully submitted that the claims as they have been amended are allowable over the art which has been applied in this Office Action. Favorable reconsideration and allowance of this application are courteously solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,
LOWE HAUPTMAN HAM & BERNER, LLP



Kenneth M. Berner
Registration No. 37,093

1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111
(703) 518-5499 Facsimile
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KMB/KT/ser